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CORRES. CONTROL
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DOE ORDER # 5480.23

95-RF-05551

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BRANCH, D. B.		
CARNIVAL, G. J.		
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FERGUSON, D. R.	X	
FERRERA, D. W.		
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GEIS, J. A.		
GLOVER, W. S.		
GOLAN, P. M.		
HANNI, B. J.		
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HEALY, T. J.		
HEDAHL, T. G.		
HILBIG, J. G.		
HUTCHINS, N. M.		
JACKSON, D. T.		
KELL, R. E.	X	
KUESTER, A. W.		
MARX, G. E.		
McDONALD, M. M.		
McKENNA, F. G.		
MONTROSE, J. K.		
MORGAN, R. V.		
POTTER, G. L.		
PIZZUTO, V. M.		
RISING, T. L.		
SANDLIN, N. B.		
SCHWARTZ, J. K.		
SETLOCK, G. H.		
SNYDER, D. P.	X	
STEWART, D. L.		
STIGER, S. G.		
TOBIN, P. M.		
VOORHEIS, G. M.		
WILSON, J. M.		
BURNS, C.	X	
JORDAN, B.	X	
SWANSON, D. R.	X	
CORRES CONTROL	X	
ADMIN RECORD/080	X	
TRAFFIC		
PATS/T130G		

CLASSIFICATION	
UCNI	
UNCLASSIFIED	X
CONFIDENTIAL	
SECRET	

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DATE: 7-27-95

IN REPLY TO RFP CC NO:

ACTION ITEM STATUS
☐ PARTIAL/OPEN
☐ CLOSED
LTR APPROVALS:

Swanson, D. R.
Ferguson, D. R.

ORIG & TYPIST INITIALS
DRS:pjs

RF-46469 (Rev. 06/94)

KAISER•HILL COMPANY

July 26, 1995 95-RF-05551

Peter S. Lee
Nuclear Safety and Emergency Preparedness Division
DOE, RFFO

COMMENTS ON DRAFT PROPOSAL: "PLUTONIUM RELEASE FRACTION FROM COMBUSTIBLE CONTAMINATED WASTES" - HJ-009-95

PURPOSE

This memo transmits my comments on your proposed experimental plan dated June 11, 1995.

DISCUSSION

I have given you a copy of your write-up with specific marginal annotations. With this memo, I would like to formally transmit some general remarks that I feel should be considered.

First of all, I applaud your approach of trying to increase our understanding of the phenomena involved. This is likely to yield more generally applicable results and improve confidence in the application of those results.

One concern I have is that the results of the experimental investigations be unequivocally applicable to the issue at hand, namely macroscopic fires of mixed waste piled in a burning petroleum pool. This means that we'll need to know how to translate the results of the focused small scale experiments you propose to the macroscopic conditions we are interested in - the dilemma we have now with regard to the existing experimental evidence. To assure that we can do that, I think it imperative that one task address what is required.

A common approach to tasks such as this is to develop macroscopic mathematical models that integrate local, mechanistic models or correlations that have been individually experimentally validated, as in your proposal. Such macroscopic models are then validated in a few, well chosen, integral experiments. This approach may not work well a priori here, as the phenomena involved are probably not well enough understood to allow their expression as mathematical models. The only alternative is, then, to develop such understanding for the integrating, macroscopic models experimentally.

Some of the macroscopic phenomena that need to be understood are:

- influence of the waste pile on the fire dynamics of the pool
- the self-interaction of the waste

- influence on gas flow
- thermal radiation shielding
- thermophoretic retention of liberated contaminant
- the interaction of waste generated soot with pool soot and liberated contaminant particles and their effect on radiative heat transfer (a very non-linear problem)

I think it essential that we make it a primary task to develop a validated model of these macroscopic phenomena. Once in place, this model should be used to identify model requirements, including local models and correlations, and thus guide the mechanism elucidation experiments of your proposal. A top-down approach.

A second concern is that we separate airborne release measurements from measurements of transport phenomena downstream of the release. The latter are very system dependent and cannot be translated to RFETS accident scenarios of interest without a theoretical understanding of the phenomena involved - and, of course, a detailed enough conceptualization of the scenario itself. There have been lots of studies of aerosol transport phenomena and we might as well rely on these. I doubt there is very much we can contribute to this complex topic within the scope of this project.

A third concern is that we keep the experimental plan flexible enough to allow for surprises. There may be many phenomena involved in the fire induced liberation of particles from their substrate. They may not all correlate with the heat flux or convection velocity and other potential parameter dependencies should be hypothesized and explored.

Fourthly, particle size will no doubt affect release, but it is important to realize that any refractory particles one might use as surrogates will be relatively polydisperse and not amenable to binning in your proposed size classes. The toxicologically important size range is the respirable size range, and in the interest of time and cost, I advocate restricting measurements to this range. One could then restrict measurements to total activity measurements without size discrimination. Alternatively, one might use a broadly dispersed contaminant surrogate and perform size discriminative measurements, in a given experiment, rather than repeat a set of experiments for different sized particles, as you propose.

Finally, I believe it to be vitally important to involve an experienced theoretical and experimental aerosol physicist in the experiments and in their design. Besides myself, I suggest George Mulholland, NIST; John Brockmann, Sandia; and Vladimir Kogan, Battelle, among others.

RESPONSE REQUIREMENTS
Please call with any questions.

H. Jordan
Engineering Integration and Risk Assessment

HJ:pjs

Orig. and 1 cc - P. S. Lee

cc:
P. M. McEahern - DOE, RFFO